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BROADBAND COMMUNICATION SYSTEM WITH SOUND, VISUAL, AND ALPHANUMERIC INFORMATION PROCESSING IN INTERACTIVE DIALOGUE

[Breitbandkommunikationssystem mit auditiver, visueller und alphanumerischer Informationsverarbeitung im Dialogverkehr]

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FOREIGN TITLE [54A]: BREITBANDKOMMUNIKATIONSSYSTEM MIT AUDITIVER, VISUELLER UND ALPHANUMERISCHER INFORMATIONSVERARBEITUNG IM DIALOGVERKEHR

Patent Claims /1*

1. Broadband communication system for interactive services with sound and/or visual information processing with utilization of the full bandwidth of a TV channel for individualized programming during the entire programming time by each subscriber, whereby the number of subscribers exceeds the number of the available channels and in which an interactive dialogue occurs in such a way that the subscriber receives sound, visual, and alphanumeric information and sends off alphanumeric, sound, or similar narrow band information via a return channel, characterized by the fact that, in a central exchange, where the individual programs are stored, a data processing facility is provided, each subscriber receives storage facilities for a small-scale data processing system to organize the interactive dialogue, and the transmission of the individual programs from the central exchange to each subscriber as well as the interactive dialogue occur in such a way that the sound, visual, and alphanumeric information is transmitted upon the request of each individual subscriber via a vacant channel to the storage facilities that are available with the subscriber and each subscriber can enter into an interactive dialogue through the input of alphanumeric and/or sound information with the small-scale data processing unit at his location and/or with the central data processing system, which respectively keep available alphanumeric and auditory information.

*Numbers in the margin indicate pagination in the foreign text.

2. Broadband communication system in accordance with Claim 1, characterized by the fact that the transmission of the individual programs occurs during off-the-air times.

Broadband Communication System with Sound, Visual, and Alphanumeric Information Processing in Interactive Dialogue /2

The invention pertains to a broadband communication system for interactive services with sound and/or visual information processing with the utilization of the full bandwidth of a TV channel for individualized programming by each subscriber during the entire programming time, whereby the number of subscribers exceeds the number of the available channels and in which a dialogue occurs in such a way that the subscriber receives sound, visual, and alphanumeric information and sends off alphanumeric, sound, or similar narrow band information via a return channel.

Aside from large-scale community antennas and cable television systems, broadband communication systems with a return channel are known to the art which, in addition to the usual distribution of television and radio programs, also facilitate the transmission of messages in the opposite direction from any subscriber to the central exchange. As a result, these systems provide the prerequisite for their additional utilization through services which can be categorized as "collection through the central exchange," "distribution upon request," and "dialogue

with the central exchange."

In their typical form, cable television systems are designed as mono-cable systems with tree configurations. They usually have a transmission frequency range from 47 to 300 MHz in the distribution direction, or 5 to 30 MHz in the collecting direction. The resulting capacity of up to approximately 30 television channels is of service in the distribution of programs (video and audio) from the central exchange to the connected subscribers. In most cases, the frequency multiplex process is employed for this purpose while a single tube coaxial cable is used.

Only a few channels can be provided for the collecting direction, /3
in order to avoid reducing the already scarce channel capacity in the distribution direction even further. On the other hand, the channel capacity of broadband communication systems cannot be increased significantly, especially if economic aspects are included in the considerations. To mention only a few examples, this applies to the use of multiple or multiple tube cables, as well as to the expansion of the transmission frequency range to the television bands IV/V (470 to 862 MHz), whereby, theoretically (if adjacent channels were operated) an additional 49 television channels could be utilized.

The present invention is based on the task of creating a broadband communication system that, above and beyond the mentioned expansion options, will offer an option of representing various individual programs with sound and/or visually presented information in a nonphysical manner to a number of subscribers that is greater than what would correspond with the available channel capacity. In this process,

the individuality in the selection of programs, the starting time of the program, as well as the option of interrupting the program at any point, and the selection of the time of reentry into the program are to be guaranteed. In addition, an individualized interaction (interactive dialogue) between the subscribers and the central exchange is to be made possible in a liberal or formatted form with data, or in the event that the appropriate equipment is available on the part of the individual subscribers, also with sound and/or visual information.

On the basis of a broadband communication system of the type described at the beginning of the text, this task is accomplished in accordance with the invention in such a way that, in a central exchange, where the individual programs are stored, a data processing facility is provided, each subscriber receives storage facilities for a small-scale data processing system to organize the interactive dialogue, and the /4 transmission of the individual programs from the central exchange to each subscriber as well as the interactive dialogue occur in such a way that the sound, visual, and alphanumeric information is transmitted upon the request of each individual subscriber via a vacant channel to the storage facilities that are available with the subscriber and each subscriber can enter into an interactive dialogue through the input of alphanumeric and/or sound information with the small-scale data processing unit at his location and/or with the central data processing system, which respectively keep available alphanumeric and auditory information.

Thus, with a broadband communication system of such a design, the option that a multitude of subscribers can be offered a variety of

programs for their individual selection is easily facilitated; and to be more specific, this is so because the part of the services which requires large bandwidth (transfer and processing of the dialogue or program parts consisting of moving and stationary images, as well as sound) is, with the option of a reproduction upon request, transmitted to storage facilities that are set up on the subscriber side or in common facilities that are used by multiple subscribers with the local intelligence for the control of processes and simple information processing capabilities, by utilizing channels which have been vacated coincidentally or on a regular basis outside of the usual air time. The storage facilities which exist on the subscriber side facilitate the supply and copying of the individual programs, e.g., during off-the-air times, while the processing of the program in the dialogue with the central exchange can be carried out without the use of a broadband channel in a time slot which is fixed in relation to the original program time or with a time-offset which can be selected by the subscriber. The program features are particularly comprised of programs for information purposes, such as advertisements of goods and services, or of programs from the educational field for the purpose of education, continuing education, and advanced education. These programs may completely, or in part, consist of moving images, and can also be equipped with a variety of program branches, whereby the program sequence following the program branch can either occur by free selection of the subscriber (e.g., educational programs with informative characteristics) according to his interests, or through the evaluation of a reply according to aspects of appropriateness (e.g., in educational programs) /5

which is considered and interpreted in the program sequence.

The details of the invention for an exemplary system configuration will be explained in greater depth by means of the drawing. Shown are

Fig. 1, depicting the basic configuration of a central exchange in a broadband communication system in accordance with the invention;

Fig. 2, depicting a design example for a unit that is provided at the subscriber location.

The starting point for the broadband communication system which will be more closely described in the following text is a large-scale community antenna system of the type known to the art, or a cable television system, in which, aside from the local regular programs that are received from the television and radio broadcast service, additional system-internal programs are distributed which cannot be received in the respective location wireless. These types of installations can now be supplemented with various equipment, more specifically, with process control and information processing equipment, with storage equipment for service contents to the extent that they consist of data and/or alphanumeric characters (strings), as well as with storage facilities for service contents to the extent that they are comprised of moving/stationary images, or other image representations (e.g., graphics).

According to the desired or offered nature of these services, the design form of the broadband communication/cable television system or its equipment technology, as well as the additional state-of-the-art equipment that is used, these can basically exist in the following locations of the broadcast network:

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Site / Additional Equipment	centrally	in subexchanges	at subscriber end
for process control	X	X	X
for storage/processing of service contents (data, αn-characters (-strings))	X	X	X
for storage/processing of service contents (moving/stationary images, other image representations	-	X	X

In the above matrix, all kinds of variations (horizontal, vertical, and combinations) are optional. For instance, aside from the image storage device (e.g., standard commercially available magnetic tape recording devices that can also be obtained with a timer, TV tuner, stationary image display, etc., or also magnetic disc memories), the subscriber equipment includes microprocessors which completely or partially take over the process control.

In the same manner, the information processing which is required in the framework of the services which are offered could be completely or partially carried out on the subscriber side.

Finally, with regard to the network configuration and the equipment technology of the process sequence which is explained as an example below, the prerequisite is that, on the basis of a single-cable tree-shaped network without subnetwork connections (single-tube coaxial cable), approximately thirty television channels in the range between 47 and 300 MHz are available in the distribution direction, three television channels in the range from 5 to 30 MHz in the collection direction, as well as approximately 10,000 bidirectional data channels which can be used in the address multiplex (a television channel is

necessary for this) and 10 transmission links are provided by the central exchange. The transmission of the data signals occurs digitally /7
in the address multiplex, while an amplitude-modified image signal that is designed according to the specific television standards of the respective country in accordance with CCIR, which, if required, can also be addressed, is provided for the audio-visual information.

Fig. 1 depicts the basic configuration of a central exchange for a broadband communication system in the form of an exemplary arrangement of the equipment which is available there. Aside from the receiver equipment (1, 2, 3, 4) that is usually available in a community or cable television system for radio broadcasts, VHF television broadcasts, UHF television broadcasts, as well as for additional programs which are supplied via line of sight, satellite, cable, or the like, the central exchange also contains a storage unit (5) with, for example, several magnetic recording devices, film reading devices, dia-scanners, etc., as well as a data processing system (6) for real-time processing with a database to which an address coder/decoder (7) and a modem (8) are connected successively. The outputs of the receiver units (1 to 4), the central storage unit (5), and the modem (8) are interconnected on the distribution network (10) via a program switch (9).

Fig. 2 depicts the exemplary configuration of the equipment on the subscriber side. In detail, it shows an input switch (11), the high-pass output of which is connected with a television set (12) on the one hand and a mini-computer with a data memory (13) on the other hand, while the low-pass output is connected to a modem (14). Via an address coder/decoder (15), this modem (14) is also connected to the mini-

computer (13) which is designed for process control and processing tasks of a small volume. On the output side, the mini-computer (13) is connected to an image memory (17) via a frequency converter (16) with a tunable input and a fixed output channel. This image memory is, e.g., a magnetic tape or magnetic disc device and additionally contains a TV tuner, a switch for the display of stationary images, as well as a timer. Another output of the mini-computer (13) is connected to a data /8
repeat memory (18) which, just like the image memory (17), is connected to the TV set (12). If required, a printer (19) may also be connected to the mini-computer (13). Finally, each unit contains an alphanumeric keypad (20) which is connected to the mini-computer (13), as well as the data repeat memory (18).

Under the above-specified prerequisites and presumptions, the following process sequence ensues in the utilization of a service from the time of the request until the termination:

A subscriber intends to receive a certain program, and therefore, for the purpose of registering a dialogue with the data processing system (6) which is located in the central exchange, he presses a start-of-message key which is provided on his keypad (20).

As a result, the mini-computer (13) associated with the subscriber automatically takes over all of the procedures (the sending out of the subscriber address, as well as of the message that a program request/selection is to be made) and finally reports to the subscriber that a connection has been established and the dialogue can begin. Now, the subscriber receives a numeric overview which is projected on the screen of his TV set (12) by the central data processing system (6),

which contains the optional interactive modes with the central exchange (e.g., program request, information request, program processing, utilization of computing capacity, etc.). The overview may also list the optional services (e.g., request/process information program, educational program, purchase, etc.). In response, the subscriber enters the identification number of the desired service "request educational program" on the keypad (20). Subsequently, he receives a numeric overview of the educational program features, e.g., sorted by subject area, meaningfully summarized by generic terms or details. Upon entering the identification number of the specific educational program, he receives the message from the central data processing system (6) whether a chan- /9
nel is vacant for the immediate copying of the program or not. If the copying process can be carried out immediately, the subscriber's mini-computer (13) receives the instruction to switch the frequency converter (16) with the tunable input to the appropriate output channel and to get the image memory (17), e.g., a magnetic tape device, ready for operation. If, for instance, a tape cassette has not been inserted, the mini-computer (13) advises the subscriber of that fact on the television screen; he also asks whether a recorded cassette should indeed be deleted.

If no channel is vacant for an immediate copying process, the subscriber is put on a waiting list which is maintained by the central computer (6) that it works off systematically by assigning vacated channels. Particularly during nighttime hours and other off-the-air times for the programs which are distributed to subscribers in general, this can occur via the cable network. Aside from these functions, the

computer is also tasked with the preparation and announcement of forecasts regarding the expected time of the channel assignment.

Especially educational programs will contain a remarkable number of program branches. All branch points, as well as paths which deviate from them, are numbered by the central computer (6) and serially recorded by the image memory (17), while in parallel, they are also being stored in the subscriber's mini-computer (13), so that the program can be worked off by the subscriber later, if possible, without having to draw upon the central computer (6). Thus, in its collaboration with the central computer (6), the mini-computer (13) is assigned the task of controlling the image memory (17) while the program is worked off according to the actions taken by the subscriber in such a way that at the right time, in the right place, the right branches or the partial links which originate from them are made available. For this purpose, it may, e.g., also be necessary--if this is provided as part of the program--to switch the image memory (17) to stationary image display or to stop the sequence, for example, because the program calls for an interaction (dialogue) /10 with the central computer (6) at that point. Finally, the printer (19) is also operated or turned off by the mini-computer (13).

After the subscriber has finished working off the program, the connection between the central computer (6) and the mini-computer (13) is interrupted upon the subscriber's instructions. In principle, the same program can be worked several times. The subscriber merely needs to keep the recorded cassette in that case and can again establish contact with the central computer (6) at the time of his choice.

In order to quantify the benefit of the invention with regard to

the servicing of large numbers of subscribers with individualized programs, the following calculation can be carried out:

The presumption is a transfer time of 20 minutes for the part of each program that is transmitted to the storage units which are set up outside of the central exchange (in most cases, at the subscriber site) via the broadband communication system. (In comparison, the utilization time through the subscriber can be substantially longer.)

At 3 programs per hour, 90 programs can therefore be transferred in one hour on 30 available channels.

Moreover, if one starts out from a broadband communication system with ten transmission link branches which respectively come out of the central exchange, to each of which 1,000 subscribers are assigned, then 10,000 subscribers can be reached.

Due to the fact that, for these transmission purposes, different programs are respectively transmitted in the same channel coordinate and can be supplied to the storage facilities that are available at the subscriber sites, the mentioned channel capacity increases tenfold, so that, per hour, 900 individual programs can be copied within this /11 system. If one bases this on the fact that, currently, an average off-the-air time of approximately 15 hours is available daily, this results in the possibility that 13,500 individual programs can be transferred within 24 hours.

Fig.1

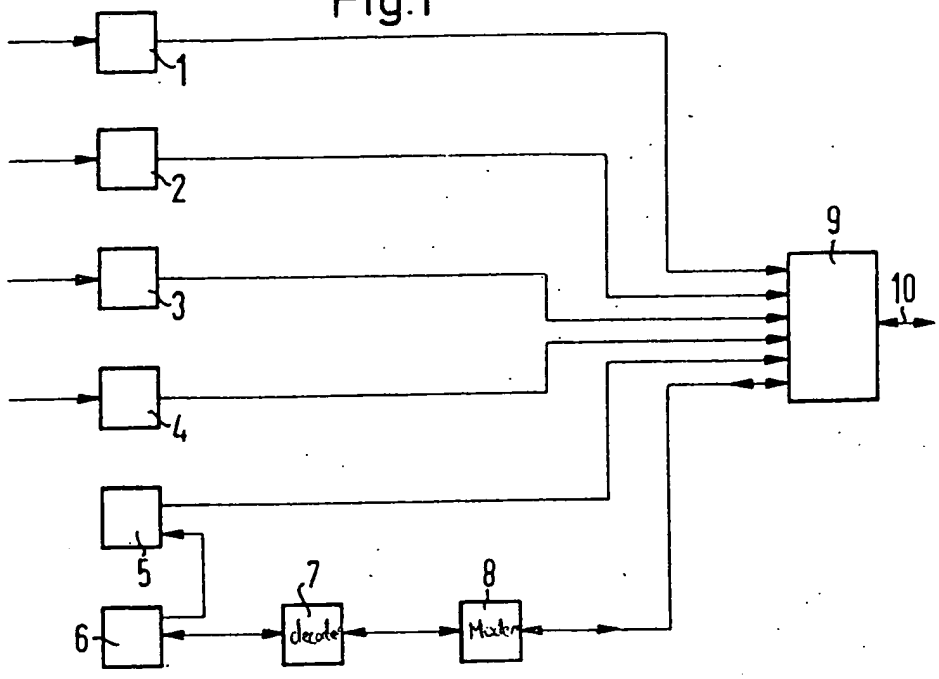

Fig.2